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M E M O R A N D U M

February 14, 1980

To: Fred Fenske/Roger Stanley
From: Bill Yake *By*
Subject: ITT Rayonier/Port Angeles Class II Inspection

Introduction

A Class II compliance sampling inspection was conducted on December 11-12, 1979 at the ITT Rayonier Pulp Mill in Port Angeles. Roger Stanley and Bob Bishop (Industrial Section) and Bill Yake (Ambient and Compliance Monitoring) represented the Department of Ecology (DOE), while Jerry Owen (Environmental Affairs), Fred Royce (Supervisor of Environmental Affairs), and Greg Smith (Head Chemist) represented the mill.

The wastewater system at the plant is shown in Figure 1. Wastewaters from the "solids sewer" are settled in the primary clarifier; then, with "strong sewer" influent routed to a deep tank activated sludge system with dissolved air flotation for sludge separation. Effluent from the filter plant and the "uncontaminated" line are combined with other wastewaters and discharged from a line running into the Strait of Juan de Fuca off Ediz Hook.

The activated sludge system is new and this was the first compliance sampling inspection at the plant since its completion.

Except for on-site spills and by-pass conditions, the effluent is discharged into waterway segment 27-01-00 (Strait of Juan de Fuca) which is identified as a segment where Class A standards (for dissolved oxygen) are not attainable by 1983 due to natural or irreversable causes (coastal upwelling).

Findings

Portable automated composite samplers were used to collect samples from influent to the deep tanks, effluent from the dissolved air flotation units, and total final effluent. Grab composites of the "uncontaminated" line and strong sewer were obtained. Samples of filter backwash and total final effluent were also collected using ITT's in-place composite samplers. Based on analyses of these samples, the plant was easily meeting the lapsed permit limitations for BOD₅. All analyses of both total effluent samples indicated that the plant was not meeting effluent

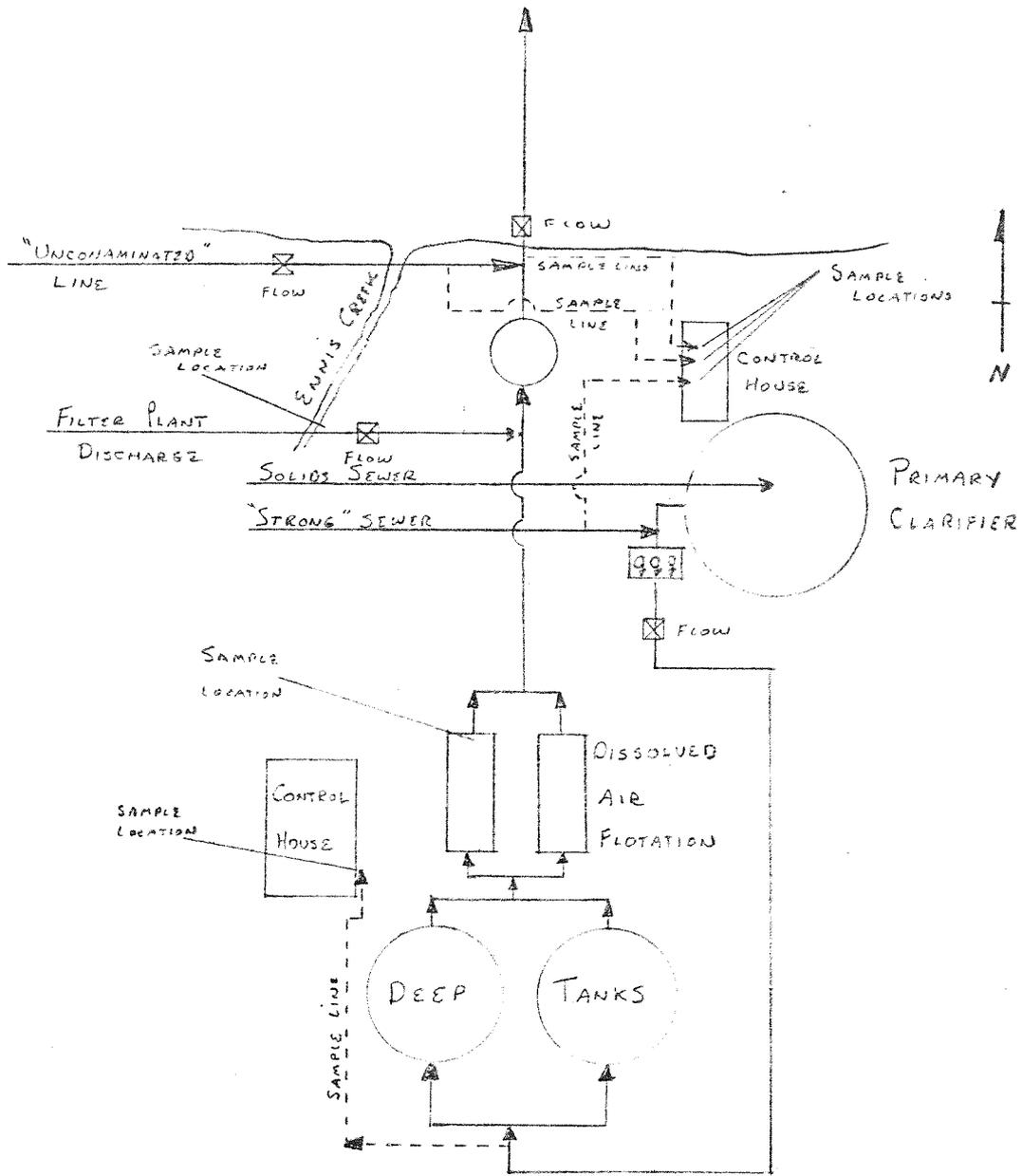


FIGURE 1. FLOW DIAGRAM, ITT/PORT ANGELES

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limitations for suspended combustable solids (suspended volatile solids). Because the conditions of the new permit are not yet fixed, the implications of these results are not clear. There are, however, several important points which should be made regarding these results:

1. Analyses of the "uncontaminated" sewer line and (probably) the total final effluent indicated the presence of reducing agents and an apparent immediate oxygen demand (IDOD). Sulfite (SO_3^-) was detected in the "uncontaminated" sewer sample and was probably responsible for some or most of this IDOD.
2. All dissolved oxygen determinations used by the DOE laboratories to calculate BOD's were made using the Winkler/Azide method. This method can be inaccurate in the presence of strong oxidizing or reducing compounds. This casts some doubt on the accuracy of the total final and "uncontaminated line" BOD analyses. However, if most or all of the reducing agent present was SO_3^- , it is likely that any positive Winkler dissolved oxygen determinations were accurate because SO_3^- reacts almost instantaneously with O_2 to form SO_4^- . The presence of any O_2 in the dilutions would then indicate that all (or nearly all) of the SO_3^- had been converted to stable SO_4^- .
3. If the Winkler dissolved oxygen analyses are correct, then a review of the raw BOD data indicates an IDOD of >8 mg/l in the "uncontaminated line" sample and an IDOD of 2 to 11 mg/l in the final effluent sample. These samples had not been isolated from atmospheric oxygen during collection. In addition, no special measures were taken during transport or pre-analysis preparation. Therefore, the actual IDOD in both samples may have been substantially higher when originally collected.
4. Agreement between ITT and DOE BOD analyses is not good. ITT's Olympic Research Lab reported no BOD results, evidently missing dilutions. ITT's reported deep tank influent sample result of 1725 mg/l compares poorly with DOE's result of 540 mg/l. ITT's result is particularly suspect in that it is higher than both COD determinations for this sample. Total effluent samples fare no better. ITT reported an effluent BOD of 50 mg/l, while DOE laboratories reported values of 16 and 17 mg/l. Use of the Winkler D.O. method casts doubts on DOE's results, while the fact that the total effluent BOD was higher than the dissolved air flotation effluent makes ITT's results at least doubtful.
5. ITT's present method for BOD₅ determination does not include IDOD. Depending on the outcome of these tests, consideration should be given to including IDOD in permit limitations.

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In light of these issues and difficulties, it would probably be wise to conduct additional sampling and tests on both the "uncontaminated line" and total final effluent. The following approaches should be considered:

1. At the secondary plant effluent and total final effluent sampling sites, obtain dissolved oxygen concentrations using a probe.
2. Obtain grab samples of "uncontaminated line" wastewater and total final effluent, seal them from contact with air, and run SO_3 , IDOD, and BOD_5 determinations. Use an oxygen probe for the IDOD and BOD determinations. The initial performance of these tests might be done in tandem with ITT and DOE laboratories. Further testing might be conducted in-house by ITT.

With regard to the effluent volatile suspended solids values, it is certain that the volatile solids found in the effluent are due to incomplete suspended solids separation in the dissolved air flotation units. Visible solids were escaping to the effluent and it appears that improved operational control should improve the efficiency of the D.A.F. units and decrease volatile suspended solids concentrations in the effluent. The presence of 5.5 ml settleable solids/l in the D.A.F. effluent is indicative of the marginal effluent clarification.

The deposition of a substantial amount of sand was noted in the bottle used to detain deep tank influent for the portable sampler. The possible source of this sand was discussed with various ITT personnel; no obvious source could be determined. It is possible that if this sand is transported continually to the deep tanks, deposits may eventually decrease the size and retention time in the tanks.

Trace metal concentrations in the effluent were generally low. The single exception was chromium (.10 to .12 mg/l). The source of this chromium is evidently as a contaminant of sodium chlorate, the raw material used by the chlorine dioxide generator. The effluent from the chlorine dioxide generating plant discharges to the "uncontaminated" sewer. On the day of the inspection, the mill was running "non-dissolving grade" pulp which evidently maximizes chlorine dioxide generation and therefore chromium concentrations in the effluent.

Plant flow meters were located in-line and were not accessible. One indication, however, of internal flow measuring accuracy is the comparison of the total flow recorded for individual streams and the record total effluent flow:

	<u>Individual Streams Flows (MGD)</u>	<u>Total Effluent Flow (MGD)</u>
Secondary Plant Effluent	24.5*	
"Uncontaminated" Line	10.1	
Filter Plant Backwash	1.75	
Total	36.4	39.5

*Meter is actually "Deep Tank Influent"
This represents an internal inconsistency of 7.8%

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Review of Laboratory Procedures and Techniques

Laboratory procedures were reviewed with Greg Smith. Techniques appear to have been substantially improved since the last inspection. In general, procedures were good; however, substantial discrepancies were noted in the split sample results. These are noted below:

Parameter	ITT Port Angeles	ITT Olympic Research	DOE Tumwater Labs
BOD ₅ (mg/l)	1725 50 52		540 42 16

pH (S.U.)		3.65	6.2

PBI (mg/l)		4400 3740 2740	2600 1900 1400

TNVS (mg/l)	0 0 0		1500 1400 1100

TNVSS (mg/l)	21 0 12		42 20 28

Laboratory procedures were not reviewed with the Olympic Research Lab. The pH analysis was run at ITT's Olympic Research Lab and appears to be an error.

BOD

The BOD₅ discrepancies are not wholly explicable. The ITT values of 1725 for deep tank effluent appears to be an error. This value exceeds all COD determinations for this sample, which is theoretically not possible. Influent values are usually near 900.

The following recommendation should improve the reliability of BOD₅ results.

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1. Age dilution water adequately to reduce unacceptable dissolved oxygen depletions in the blank. This may be accomplished by lightly seeding the dilution water and aging for 1 to 2 weeks. Five-day oxygen drops in the blank should not exceed 0.2 mg/l.

Total and Volatile Suspended Solids

Suspended solids results compared favorably; non-volatile results did not. The following recommendations are made to improve the reliability of these tests.

1. Filter papers should be prewashed with distilled or de-ionized water prior to drying, dessication, and obtaining tare weight.
2. Because of the size of the filters used (11 cm diameter), sample volumes should be increased from the 100 ml now used. *Standard Methods* suggests that for volatile suspended solids analyses, samples be ≥ 14 ml/cm² of filter area. For an 11 cm filter, this calculates to about 1300 ml. Although this may be impractical, we suggest that sample volumes of at least 500 ml be processed.

WEY:cp

Attachments

Class II Field Review and Sample Collection

24-hour Composite Sampler Installations

Sampler	Date and Time Installed	Location
1. Dissolved Air Flotation Eff. sample aliquot: 250 ml/30 min.	12/11/79 - 0900	At outfall end of DAF tank #1 and 2 (west)
2. Deep Tank Influent sample aliquot: 250 ml/30 min.	12/11/79 - 0940	ITT Sample Tap, at treatment control building
3. Total Plant Effluent sample aliquot: 250 ml/30 min.	12/11/79 - 1010	ITT Sample Tap, in primary clarifier building
4. sample aliquot:		
5. sample aliquot:		

Field Data

Parameter(s)	Date and Time	Sample Location
Temp., pH, Cond.	12/11/79 - 0820, 1052, 1430; 12/12/79 - 0915	Uncontaminated Line
Temp., pH, Cond. Settleable Solids	12/11/79 - 0900, 0920; 12/11/79 - 1010	Dissolved Air Flotation Eff. Dissolved Air Flotation Eff.
Temp., pH, Cond.	12/11/79 - 0830, 1050, 1640; 12/12/79 - 0910	Strong Sewer
Temp., pH, Cond.	12/11/79 - 0910, 1655	Aeration Tank Influent
Temp., pH, Cond.	12/11/79 - 1010	Total Plant Effluent

Grab Samples

Lab Analysis	Date and Time	Sample Location
See Table 2	12/11/79 - 0820, 1052, 1430; 12/12/79 - 0915	Uncontaminated Line
See Table 2	12/11/79 - 0830, 1050, 1640; 12/12/79 - 0910	Strong Sewer
Solids	12/12/79 - 1015	Dissolved Air Flotation Inf.
Solids	12/12/79 - 1015	Return Activated Sludge
F. Coli & Kleb.	12/12/79 - 1040, 1050	Total Plant Effluent

Table i. Analytical results, Dept. of Ecology Laboratory

	DOE Samples				ITT Sample Total Final Effluent	Lapsed NPDES [†] Permit Limitations
	Deep Tank Influent	Deep Tank Effluent	Dissolved Air Eff.	Total Final Effluent		
Flow (MGD)	24.49	(24.5)	(24.5)	39.49	39.53	
BOD ₅ (mg/l)	540	--	42	17	16	
(lbs/day)	110,000	--	8,582	5,600	5,270	300,000
Sus. Combustable Sol. (mg/l)	34	890	67	57	48	
(lbs/day)	694.4	--	13,690	18,800	15,800	11,000
COD (mg/l)	1,600	--	920	640	630	
PBI (mg/l)	2,600	--	1,900	1,400	1,200	
pH (S.U.)	12.0*	--	6.6*	6.2*		
	2.1*	--	6.5*			
			6.8**			
Spec. Cond. (µmhos/cm)	2,140	--	2,070	1,800	1,710	
	3,120*	--	2,000*	1,450*	--	
	2,080*	--	1,910*	--	--	
	2,070**	--	2,100**	1,780**	--	
Temperature (°C)	27.2*	--	29.8*	22.8*	--	
	27.3*	--	30.0*		--	
Total Solids (mg/l)	2,500	3,400	2,200	1,700	1,700	
TNVS (mg/l)	1,500	1,700	1,400	1,100	1,100	
TSS (mg/l)	76	1,000	87	85	84	
TNVSS (mg/l)	42	110	20	28	36	
Settleable Solids (mg/l)			5.5			
NH ₄ -N (mg/l)	31	--	18	17	24	
NO ₂ -N (mg/l)	<.05	--	<.05	<.05	<.05	
NO ₃ -N (mg/l)	0.2	--	<.05	<.05	<.05	
O-PO ₄ -P (mg/l)	0.5	--	6.0	5.5	5.9	
T-PO ₄ -P (mg/l)	0.8	--	8.0	5.7	6.2	
Fecal Coliforms (#/100 ml)	--	--	--	29,000	--	
	--	--	--	2,500	--	
Klebsiella (%)	--	--	--	80%	--	
(%)	--	--	--	86%	--	
Turbidity (JTU)	35	--	30	48	40	
Color	2,800	--	2,900	1,100	1,300	
Copper (mg/l)				.02	.02	
Chromium (mg/l)				.12	.10	
Lead (mg/l)				<.05	<.05	
Zinc (mg/l)				.09	.09	
Nickel (mg/l)				<.05	<.05	
Cadmium (mg/l)				<.01	<.01	

† = Daily Average

* = Field Analysis - Instantaneous Grab Sample

** = Field Analysis - Composite Sample

Table 2. Analytic Results, Department of Ecology Laboratory

	ITT Sample Filter Plant Backwash	Strong Sewer	"Uncontaminated" Line	Return Activated Sludge
Flow (MGD)	1.75	--	10.1	1.19
BOD ₅ (mg/l)	--	660	8 [†]	--
(lbs/day)	--	--	674	--
Sus. Combustable Solids (mg/l)	10	26	8	--
(lbs/day)	146	--	674	--
COD (mg/l)	22	2,000	65	--
PBI (mg/l)	--	1,800	<5	--
pH (S.U.)	--	12.3*	3.2*	--
	--	1.3*	3.0*	--
	--	1.2*	2.0*	--
	--	9.9*	2.1*	--
Spec. Cond. (μmhos/cm)	90	3,280	4,210	--
		6,000*	2,480*	--
		4,300*	860	--
		5,200*	2,320*	--
		5,500*	2,880*	--
Temperature (°C)		27.0*	25.4*	--
		26.2*	24.5*	--
		29.3*	26.2*	--
		26.5*	24.2*	--
Total Solids (mg/l)	140	3,600	1,300	26,000 (2.6%)
TNVS (mg/l)	130	2,300	600	3,100 (0.3%)
TSS (mg/l)	84	38	61	23,000 (2.3%)
TNVSS (mg/l)	74	12	53	1,700 (0.2%)
NH ₄ -N (mg/l)	0.5	37	57	--
NO ₂ -N (mg/l)	<.1	<.05	<.05	--
NO ₃ -N (mg/l)	<.1	<.05	<.05	--
O-PO ₄ -P (mg/l)	.2	.95	.25	--
T-PO ₄ -P (mg/l)	.6	1.4	.4	--
Turbidity (JTU)	54	15	40	--
Color	8	3,900	13	--

† = Immediate Demand Excluded

* = Field Analysis - Instantaneous Grab Sample

** = Fixed Analysis - Composite Sample

Table 3. Analytical Results of ITT Rayonier Laboratories

	Deep Tank Influent	Dissolved Air Effluent	Total Final Effluent	Lapsed NPDES+ Permit Limitation
Flow (MGD)	24.5	(24.5)	39.5	
BOD ₅ (mg/l) (lbs/day)	1,725* 352,000	50* 10,200	52* 17,100	300,000
Sus. Combustable Solids (mg/l) (lbs/day)	45* 9,190	77* 15,700	66* 21,700	11,000
COD (mg/l)	1,419**	932**	421**	
PBI	4,400**	3,740**	2,740**	
pH	8.1**	6.8**	3.65**	
Spec. Cond. (µmhos/cm)	2,025**	1,980**	1,675**	
Total Solids (mg/l)	2,700*	2,700*	1,900*	
TNVS (mg/l)	0*	0*	0*	
TNVSS (mg/l)	21*	0*	12*	
Color (S.U.)	1,880**	1,964**	1,134**	
Kjeldahl-Nitrogen (mg/l)	38.4**	31.5**	27.7**	

† = Daily Average

* = Analyzed by Port Angeles Laboratory

** = Analyzed by Olympic Research Division